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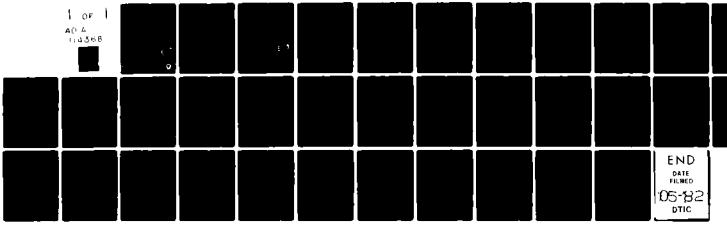

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HISTORICAL RESEARCH AND DEVELOPMENT INFLATION INDICES FOR ARMY FIXED AND ROTOR WINGED AIRCRAFT

ANNUAL REPORT

CHARLES W. LINES, JR.

WILLIAM J. WAYMIRE

JANUARY 1982

APPROVED FOR PUBLIC RELEASE DISTRIBUTION UNLIMITED

US ARMY AVIATION RESEARCH AND DEVELOPMENT COMMAND
DIRECTORATE FOR PLANS AND ANALYSIS
DATA ANALYSIS AND CONTROL DIVISION
4300 GOODFELLOW BOULEVARD
ST. LOUIS, MO 63120

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20. ABSTRACT *(Continue on reverse side if necessary and identify by block number)*

This Technical Memorandum is a continuation of previous efforts to develop the necessary rationale and methodology needed in order to construct historical inflation indices, in the Research and Development (R&D) area, relative to Army aircraft. The R&D historical indices, and the sub-indices from which they are derived, are presented in the appendices to this report for the period FY68 through FY81. These indices are appropriate for updating statistical reports that formerly utilized the OSD forecasting indices; for initial use in bringing a cost in prior years to a present-year dollar value; and for evaluating

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20. ABSTRACT (Continued).

inflation actually experienced. A computer program is utilized to make the necessary mathematical calculations.

Data sources for this report were the Office of Personnel Management (OPM) and the Bureau of Labor Statistics (BLS). OPM supplied data on government salaries. BLS furnished data on industry salaries and thirteen (13) different materials.

The computer program prints the R&D historical inflation indices and sub-indices by fiscal year as shown in Appendices C through G of this report.

Delete superfluous part of statement A in Block 16 of DD Form 1473 per Mrs. Capp USAAVRADCOM/ Directorate of Plans and Analysis.

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ACKNOWLEDGEMENTS

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I. INTRODUCTION AND APPLICABILITY.

A. This report is the third revision to the AVRADCOM Historical Research and Development Inflation Indices for Army Fixed and Rotary Winged Aircraft.

B. The Labor/Material Mix is not the same for all R&D program categories. Four different inflation indices have been constructed representing the most common Labor/Material Mixes.

C. New materials and new applications for existing materials are being continually developed and tested. The Bureau of Labor Statistics' Producer Prices and Price Indexes (PPI) data currently used represents these new materials and applications with varying degrees of accuracy. Research and analysis in this area, which is designed to insure the application of the most appropriate PPIs, is continuing. Fortunately, the material portion in R&D is low and changes in the material mix will not seriously effect the overall accuracy of the indices. Current research effort is aimed at isolating the overhead component in the R&D indices which have already been constructed. Preliminary results indicate that each of the R&D category indices will increase at faster rates when an overhead component is added using an appropriate weighted component of the Consumer Price Index.

D. Although the major portion of the AVRADCOM R&D effort is directed toward rotary wing aircraft, these historical R&D indices may be used for light fixed wing aircraft, also.

E. This report summarizes the efforts to develop necessary methodology to construct historical R&D indices relative to the Army Aviation Research and Development Program. Appendices C through G were developed from computer printouts that were utilized for the computation of the actual indices to be applied.

F. These R&D historical indices are appropriate for updating statistical reports that formerly utilized the OSD forecasting indices; for initial use in bringing a cost in prior years to a present-year dollar value; and for evaluating inflation actually experienced in Army Aviation Research and Development.

G. In conjunction with the historical inflation indices, AVRADCOM develops program unique inflation indices. These latter indices allow increased accuracy in tracking that portion of specific program's cost impacts which can be attributed to past inflation. In February 1981, for example, a program unique inflation index was developed for the Remotely Piloted Vehicle (RPV) Program. The RPV unique index is being used to accurately track inflation and was also made a part of the Baseline Cost Estimate (BCE) and Independent Cost Estimate (ICE). The R&D indices presented in this report, on the other hand, are intended for use by any or all Army aviation programs.

II. METHODOLOGY.

A. Labor Costs:

1. No clerical or unskilled labor was costed for either Industry or Government. This should not effect the relative costs.

2. The Industry Labor Index[1/] was compiled by costing applicable professional people from the Bureau of Labor Statistics' Annual Bulletin National Survey of Professional, Administrative, Technical, and Clerical Pay, March 1981.

3. The Government Labor Index[2/] was compiled by using the appropriate General Schedule Index received from the Office of Personnel Management.

4. Statistical analysis of the number of government and the number of contractual personnel engaged in Research and Development (R&D) indicates a ratio of 40 percent Government to 60 percent Contractual (Industry).

B. Material Costs:

1. A survey of Army Aviation R&D activities was made to determine materials utilized. The list contained aluminum, nickel, titanium, cobalt, steel, copper and iron alloys; fiberglass, plastics, natural rubber, butyl rubber, neoprene, teflon, tungsten-carbide, polyurethane, epoxy resin, Nomex and Kevlar.

2. This list of materials was then matched, as closely as possible, to a PPI series and weighted by the percent of total cost. The result is shown in the following table.

FOOTNOTES: 1/ Appendix A

2/ Appendix B

MATERIAL MIX

MATERIAL	PPI SERIES	PPI CODE	WEIGHTING FACTOR
Rubber	Rubber & Plastic Products	07	1%
Fiberglass	Rubber & Plastic Products	07	3%
Nomex	Paperboard, Container Board	09 14 01	10%
Steel Sheet, Flat	Steel Sheets, C.R., Carbon	10 13 02 62	12.5%
Steel Sheet, Stainless	Steel Sheetc, C.R., Stainless	10 13 02 64	12.5%
Closed Die Forgings	Closed Die Forgings, Alloy Steel	10 15 01 53	5%
Cobalt Alloy	Cobalt	10 22 01 05	4%
Aluminum Sheet	Aluminum Sheet, Flat 5052-H 32	10 25 01 01	13%
Aluminum Rod, Screw Machine Stock	Aluminum Rod, Screw Machine Stock, 2011-T3	10 25 01 13	3%
Aluminum Extrusion	Aluminum Extrusion, Solid, Circle Size, 4 to 5	10 25 01 17	10%
Copper	Copper & Brass Mill Shapes	10 25 02	1%
Nickel Alloy	Monel Sheet, CR 400 Alloy	10 25 04 63	23%
Titanium	Titanium Mill Shapes[3/] (From Dec 70)	10 25 05	2%
	Titanium Sponge (Before Dec 70)	10 22 01 56	

C. Labor/Material Mix by RDT&E Program Category.

1. Generally speaking, the earlier the research in time, the less materials are required. Although tables are provided for the four most common Labor/Material Mixes, an index may be easily constructed for any Labor/Material Mix by using the Weighted Labor[4/] and the Weighted Material[5/] Subindices.

FOOTNOTES: 3/ PPI Index multiplied by a factor of .955 to give continuity with titanium sponge before Dec 70.

4/ Appendix E.

5/ Appendix F.

2. The Research and Technology Laboratory Headquarters at Moffett Field, California, has determined that a mix of 95 percent labor and 5 percent material is appropriate for 6.1/6.2 program categories.[6/]

3. Projects in the 6.3 program category have a mix of 90 percent labor and 10 percent material; and in the 6.4 program category, a mix of 85 percent labor and 15 percent material is normal.[6/]

4. Finally, an "Other" index is provided based on a mix of 75 percent labor and 25 percent material for those programs that produce a quantity of prototypes in the 6.4 program category.[6/]

5. If the use of only one index is desired, it is recommended that you use the index associated with the 6.4 RDT&E program category, or, if more accuracy is desired, a weighted 6.1 thru 6.4 index can be calculated using the percentages of the total R&D expenditure of a similar system as the weights.

III. COMPARATIVE ANALYSIS.

A. In general, the R&D indices representing the early stages of the R&D life cycle increased at a faster rate in 1981 than during the previous year; primarily because of the high proportion of labor input relative to material input. Specifically, these categories are the 6.1/6.2 and 6.3 categories. The R&D index for 6.1/6.2 category increased 9.8 percent in FY 81, up from 9.06 of a year earlier. Similarly, the 6.3 R&D index rose 9.6 percent in FY81 after a 9.3 increase in FY80. Recalling that both the 6.1/6.2 and 6.3 categories have 95 percent and 90 percent, respectively, of their input provided as labor, it is not surprising that their index values are principally determined by the labor indices shown in Appendix C and whose weighted values increased approximately 10 percent in FY81, up almost two percent over FY80. On the other hand, the index for material input grew at a mere 4.8 percent rate

in FY81 as compared to 9.6 percent in the previous year.

B. All material commodities either decreased in cost during FY81 or advanced at a slower rate than that experienced in FY80. For example, the cost of steel sheet, stainless, fell three percent in FY81 while the price of titanium rose 27.7 percent in FY81 as compared to 39 percent in FY80.

C. Industry labor cost increased slightly faster than government labor cost during FY81, but the rate of this increase was somewhat faster for government labor than the rate of increase for industry labor. Industry labor cost increased 10.8 percent in FY81 and 9.9 percent in FY80. Government labor cost, however, increased 9.1 percent in FY81 and 7.02 percent in FY80.

IV. SUMMARY.

A. This third revision, to the AVRADCOM Historical Research and Development Inflation Indices for Army Fixed and Rotary Winged Aircraft, follows the same methodology used in the second revision dated January 1981. The assumptions and techniques remained the same, also.

B. The R&D indices appear in the last column of each of the four charts in Appendix H.

FOOTNOTE: 6/ Appendix G.

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VI. ACRONYMS.

AAH	- Advanced Attack Helicopter
ACO	- Administrative Contracting Officer
ASRO	- Advanced Systems Research Office
ASTIO	- Advanced Systems Technology and Integration Office - (AVRADCOM)
ATDE	- Advanced Technology Demonstrator Engine
AVRADCOM	- US Army Aviation Research and Development Command
BLS	- Bureau of Labor Statistics - (Department of Labor)
CCDR	- Contractor Cost Data Reporting
CEIS	- Cost and Economic Information System
CIR	- Cost Information Report
CY	- Calendar Year
DCAA	- Defense Contract Audit Agency
DCAS	- Defense Contract Administration Service
DT	- Development Test
DTUPC	- Design to Unit Production Cost
ED	- Engineering Development
ERADCOM	- US Army Electronics Research and Development Command
EW	- Empty Weight
FY	- Fiscal Year
G&A	- General and Administrative
GNP	- Gross National Product
IR	- Infrared
IR&D	- Independent Research and Development

LAMPS	- Light Airborne Multipurpose System
MLH	- Medium Lift Helicopter
MTBR	- Mean Time Between Removals
OSD	- Office of the Secretary of Defense
PM	- Project Manager; Product Manager
PPI	- Producer Price Index (formerly Wholesale Price Index)
RDT&E	- Research, Development, Test and Evaluation
SHP	- Shaft Horsepower
SIC	- Standard Industrial Commodity
STAGG	- Small Turbine Advanced Gas Generator
TSARCOM	- US Army Troop Support and Aviation Materiel Readiness Command
V/STOL	- Vertical/Short Takeoff and Landing
WPI	- Wholesale Price Index (now Producer Price Index)

VII. DEFINITIONS.

Appropriation Pattern:	The time-phased plan of a program's calendar year buys. (An Army-pattern usually covers a five (5) year period.) (Source: PRIMIR Guide from DARCOM, 1967.)
Base Year:	Period (e.g., fiscal year) selected as a reference for derivation of index numbers or escalation factors.
Constant Year Dollars:	Always associated with a base year (e.g., FY 72 constant dollars). An estimate is said to be in constant dollars if costs for all work are adjusted so that they reflect the level of prices of the base year. When prior or future costs are stated in constant dollars, the figures given are adjusted to presume that the buying power of the dollar was the same and will continue to remain the same as the base year. (DOD Economic Analysis Handbook.)
Current Year or "Then Year" Dollars:	Current to the year the work is performed. When prior costs are stated in current year dollars, the figures given are the actual amounts paid out. When future costs are stated in current year dollars, the figures given are the actual amounts which will be paid including any amount due to future price changes. When making future estimates, it is necessary to initially assume a base buying power for each dollar (constant dollars) and then apply an escalating factor for inflation which converts our estimate into current year dollars. The "current year" in "current year dollars" does not refer to the year in which the estimate is made or any other single year. (Source: TARADCOM Economic Analysis Handbook.)
Deflator:	A special case of an index. Used to convert current year dollars to the equivalent value of a given base year. (Source: TARADCOM/TARCOM Inflation/Price Escalation Instructions, DRDTA-VC, Jan 78.)
Escalated Costs: (Inflated Costs)	Dollars adjusted by a price escalation factor or a price level index.

Expenditure Profile: (Outlay Rate)	The time-phased estimate of a program's actual annual expenditures. Term may be applied to the expenditure of a given year's appropriation over time. (Source: TARADCOM/TARCOM Inflation/ Price Escalation Instructions, DRDTA-VC, Jan 78.)
Factor:	A price or cost relative derived from an index for the purpose of escalating or de-escalating costs (base year factor - 1.00).
Index:	A numerical procedure for tracking cost changes over time. (Source: Technical Report No. 77-1, "An Introduction to Basic Theory and Their Application, with Sample Problems, "U.S. Army TSARCOM, Oct 77.)
Inflator:	An index used to convert given base year dollars to the equivalent value of a current year. (Source: USAF, Aeronautical Cost Indices, May 77.)
Price Escalation Factor: (Inflation Index)	A number which converts prior year actual prices to base year prices through use of a price level index.
TOA:	Total Obligation Authority. (Source: AR 310-50, Nov 75, pg 74.)
Unescalated Costs:	Constant dollars unadjusted by a price escalation factor or a price level index.
Weighted Index:	An index reflecting the impact of an expenditure profile. (Source: USAF, Aeronautical Cost Indices, May 77.)
6.1 Research	Research includes all effort directed toward increased knowledge of natural phenomena and of the environment. The primary aim is to gain fuller knowledge and/or understanding of the hard sciences for example, physics, chemistry, biomedicine, engineering, and mathematics. It does not include the solving of behavioral and social science problems that have a clear direct military application, nor does it include the solving of human relations and factors which occur in conjunction with human use and acceptance in a man/group application to equipment, materiel, and/or systems. Research efforts result in an increased knowledge of natural phenomena and/or improved technology.

6.2 Exploratory Development	Exploratory development includes all effort directed toward solving specific military problems short of major developments projects. It may vary from fairly fundamental applied research to quite sophisticated prototype hardware, study, programming, and planning efforts. It would thus include studies and minor development efforts. The dominant characteristic is that the effort is pointed toward specific miliary problem areas with a view toward developing and evaluating the feasibility and practicability of proposed solutions and determining their parameters.
6.3 Advanced Development	Advanced development includes all projects that have progressed to developing hardware for experimental or operational test. It is characterized by line item projects, and program control is exercised on a project basis. Another descriptive characteristic is the design of the items being directed toward hardware for test or experimentation as opposed to items designed and engineered for eventual military service use.
6.4 Engineering Development	Engineering development includes those development projects being engineered for military service use but which have not yet been approved for procurement or operation. It is characterized by major line item projects; program control is exercised by reviewing individual projects.

(Source: Army Aviation RDT&E Plan, US Army Research and Technology Laboratories, Ames Research Center, Moffett, Field, CA, October 1977.)

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APPENDIX A

INDUSTRY LABOR INDEX

YEAR	ESCALATION SINCE LAST SURVEY	INDEX
1967	-	100.0
1968	5.5%	105.5
1969	5.8	111.6
1970	6.2	118.5
1971	6.7	126.5
1972	5.5	133.4
1973	5.4	140.6
1974	6.3	149.5
1975	8.3	161.9
1976	6.7	172.8
1977	7.1	185.0
1978	8.3	200.4
1979	7.7	215.8
1980	9.9	237.2
1981	10.8	262.9

APPENDIX B

GOVERNMENT LABOR INDEX

DATE	ESCALATION SINCE LAST INCREASE	INDEX
Jul 1, 1966	2.9%	100.0
Oct 1, 1967	4.5	104.5
Jul 1, 1968	4.9	109.6
Jul 1, 1969	9.1	119.6
Dec 27, 1969	6.0	126.8
Jan 1, 1971	5.96	134.4
Jan 1, 1972	5.5	141.8
Oct 1, 1972	5.14	149.1
Oct 1, 1973	4.77	156.2
Oct 1, 1974	5.48	164.8
Oct 1, 1975	5.00	173.0
Oct 1, 1976	5.17	181.9
Oct 1, 1977	7.03	194.7
Oct 1, 1978	5.46	205.3
Oct 1, 1979	7.02	219.7
Oct 1, 1980	9.1	239.7

APPENDIX C

COMPUTATIONS FOR LABOR INDICES LISTED BY TYPE OF LABOR UTILIZED

COMPUTATIONS FOR GOVERNMENT PERSONNEL
GENERAL SCHEDULE(GS) SALARIES

FISCAL YEAR	PRICE INDEX	INFLATION FACTOR	%	COMPUTATION
1968	100.0	2.3187	40.00	0.9275
1969	106.0	2.1870	40.00	0.8748
1970	119.2	1.9456	40.00	0.7782
1971	126.3	1.8354	40.00	0.7342
1972	133.6	1.7357	40.00	0.6943
1973	142.5	1.6276	40.00	0.6510
1974	149.4	1.5522	40.00	0.6209
1975	157.3	1.4737	40.00	0.5895
1976	165.4	1.4022	40.00	0.5609
1977	167.4	1.3855	40.00	0.5542
1978	176.0	1.3178	40.00	0.5271
1979	188.3	1.2311	40.00	0.4924
1980	198.6	1.1676	40.00	0.4670
1981	212.5	1.0910	40.00	0.4364
	231.9	1.0000	40.00	0.4000

COMPUTATIONS FOR CONTRACTOR PERSONNEL
PROFESSIONAL, ADMINISTRATIVE, AND TECHNICAL SUPPORT

FISCAL YEAR	PRICE INDEX	INFLATION FACTOR	%	COMPUTATION
1968	100.0	2.5248	60.00	1.5149
1969	105.7	2.3884	60.00	1.4330
1970	112.1	2.2513	60.00	1.3508
1971	119.6	2.1116	60.00	1.2670
1972	126.5	1.9966	60.00	1.1979
1973	133.3	1.8941	60.00	1.1365
1974	141.4	1.7851	60.00	1.0711
1975	152.5	1.6555	60.00	0.9933
1976	163.3	1.5458	60.00	0.9275
1977	166.0	1.5214	60.00	0.9128
1978	177.7	1.4211	60.00	0.8526
1979	192.5	1.3119	60.00	0.7871
1980	207.3	1.2183	60.00	0.7310
1981	227.8	1.1083	60.00	0.6650
	252.5	1.0000	60.00	0.6000

APPENDIX D

COMPUTATIONS FOR MATERIAL INDICES LISTED BY MATERIAL

COMPUTATIONS FOR RUBBER

07 RUBBER AND PLASTIC PRODUCTS

FISCAL YEAR	PRICE INDEX	INFLATION FACTOR	%	COMPUTATION
1968	100.0	2.2572	1.00	0.0226
1969	102.1	2.2118	1.00	0.0221
1970	105.0	2.1503	1.00	0.0215
1971	106.8	2.1134	1.00	0.0211
1972	107.2	2.1063	1.00	0.0211
1973	108.1	2.0880	1.00	0.0209
1974	118.0	1.9121	1.00	0.0191
1975	144.7	1.5599	1.00	0.0156
1976	150.3	1.5015	1.00	0.0150
197T	158.0	1.4283	1.00	0.0143
1977	163.1	1.3843	1.00	0.0138
1978	169.3	1.3335	1.00	0.0133
1979	184.3	1.2246	1.00	0.0122
1980	208.6	1.0821	1.00	0.0108
1981	225.7	1.0000	1.00	0.0100

COMPUTATIONS FOR FIBERGLASS

07 RUBBER AND PLASTIC PRODUCTS

FISCAL YEAR	PRICE INDEX	INFLATION FACTOR	%	COMPUTATION
1968	100.0	2.2564	3.00	0.0677
1969	102.1	2.2111	3.00	0.0663
1970	105.0	2.1496	3.00	0.0645
1971	106.8	2.1127	3.00	0.0634
1972	107.2	2.1057	3.00	0.0632
1973	108.1	2.0873	3.00	0.0626
1974	118.0	1.9114	3.00	0.0573
1975	144.7	1.5594	3.00	0.0468
1976	150.3	1.5011	3.00	0.0450
197T	158.0	1.4278	3.00	0.0428
1977	163.1	1.3838	3.00	0.0415
1978	169.3	1.3331	3.00	0.0400
1979	184.3	1.2242	3.00	0.0367
1980	208.6	1.0818	3.00	0.0325
1981	225.6	1.0000	3.00	0.0300

COMPUTATIONS FOR NOMEX
09 14 01 PAPERBOARD, CONTAINER BOARD

FISCAL YEAR	PRICE INDEX	INFLATION FACTOR	%	COMPUTATION
1968	100.0	2.5811	10.00	0.2581
1969	98.1	2.6316	10.00	0.2632
1970	103.5	2.4926	10.00	0.2493
1971	103.0	2.5063	10.00	0.2506
1972	106.0	2.4357	10.00	0.2436
1973	112.3	2.2976	10.00	0.2298
1974	127.4	2.0255	10.00	0.2025
1975	174.7	1.4773	10.00	0.1477
1976	180.4	1.4311	10.00	0.1431
197T	186.4	1.3844	10.00	0.1384
1977	180.9	1.4266	10.00	0.1427
1978	176.6	1.4612	10.00	0.1461
1979	198.7	1.2988	10.00	0.1299
1980	239.0	1.0801	10.00	0.1080
1981	258.1	1.0000	10.00	0.1000

COMPUTATIONS FOR STEEL SHEET, FLAT
10 13 02 62 STEEL SHEETS, C. R. , CARBON

FISCAL YEAR	PRICE INDEX	INFLATION FACTOR	%	COMPUTATION
1968	100.0	3.1809	12.50	0.3976
1969	104.8	3.0357	12.50	0.3795
1970	110.7	2.8734	12.50	0.3592
1971	117.4	2.7094	12.50	0.3387
1972	127.9	2.4869	12.50	0.3109
1973	132.3	2.4052	12.50	0.3007
1974	139.4	2.2825	12.50	0.2853
1975	184.6	1.7233	12.50	0.2154
1976	191.7	1.6593	12.50	0.2074
197T	205.6	1.5471	12.50	0.1934
1977	220.2	1.4448	12.50	0.1006
1978	245.4	1.2963	12.50	0.1620
1979	271.1	1.1734	12.50	0.1467
1980	288.0	1.1046	12.50	0.1381
1981	318.1	1.0000	12.50	0.1250

COMPUTATIONS FOR STEEL SHEETS, STAINLESS

10 13 02 64 STEEL SHEETS, C.R., STAINLESS

FISCAL YEAR	PRICE INDEX	INFLATION FACTOR	%	COMPUTATION
1968	100.0	2.2295	12.50	0.2787
1969	102.7	2.1706	12.50	0.2713
1970	122.1	1.8254	12.50	0.2282
1971	128.8	1.7306	12.50	0.2163
1972	133.6	1.6682	12.50	0.2085
1973	116.4	1.9147	12.50	0.2393
1974	129.9	1.7161	12.50	0.2145
1975	168.3	1.3249	12.50	0.1656
1976	159.0	1.4024	12.50	0.1753
197T	168.2	1.3255	12.50	0.1657
1977	187.1	1.1916	12.50	0.1489
1978	193.9	1.1500	12.50	0.1438
1979	208.2	1.0708	12.50	0.1338
1980	227.6	0.9798	12.50	0.1225
1981	222.9	1.0000	12.50	0.1250

COMPUTATIONS FOR CLOSED DIE FORGINGS

10 15 01 53 CLOSED DIE FORGINGS, ALLOY STEEL

FISCAL YEAR	PRICE INDEX	INFLATION FACTOR	%	COMPUTATION
1968	100.0	3.6153	5.00	0.1808
1969	103.4	3.4961	5.00	0.1748
1970	111.7	3.2362	5.00	0.1618
1971	118.6	3.0483	5.00	0.1524
1972	126.1	2.8671	5.00	0.1434
1973	132.2	2.7356	5.00	0.1368
1974	142.0	2.5466	5.00	0.1273
1975	179.8	2.0109	5.00	0.1005
1976	199.8	1.8097	5.00	0.0905
197T	218.2	1.6569	5.00	0.0828
1977	229.4	1.5762	5.00	0.0788
1978	254.1	1.4226	5.00	0.0711
1979	286.1	1.2635	5.00	0.0632
1980	326.2	1.1083	5.00	0.0554
1981	361.5	1.0000	5.00	0.0500

COMPUTATIONS FOR COBALT ALLOY

10 22 01 05 COBALT

FISCAL YEAR	PRICE INDEX	INFLATION FACTOR	%	COMPUTATION
1968	100.0	11.9302	4.00	0.4775
1969	100.0	11.9382	4.00	0.4775
1970	111.7	10.6878	4.00	0.4275
1971	118.9	10.0406	4.00	0.4016
1972	125.6	9.5012	4.00	0.3800
1973	142.3	8.3875	4.00	0.3355
1974	172.6	6.9187	4.00	0.2767
1975	208.3	5.7306	4.00	0.2292
1976	219.8	5.4310	4.00	0.2172
197T	246.9	4.8353	4.00	0.1934
1977	288.8	4.1341	4.00	0.1654
1978	420.5	2.8388	4.00	0.1136
1979	1252.4	0.9532	4.00	0.0381
1980	1351.5	0.8833	4.00	0.0353
1981	1193.8	1.0000	4.00	0.0400

COMPUTATIONS FOR ALUMINUM SHEET

10 25 01 01 ALUMINUM SHEET, FLAT 5052-H32

FISCAL YEAR	PRICE INDEX	INFLATION FACTOR	%	COMPUTATION
1968	100.0	2.7080	13.00	0.3520
1969	106.2	2.5510	13.00	0.3316
1970	110.1	2.4585	13.00	0.3196
1971	108.3	2.4998	13.00	0.3250
1972	105.5	2.5669	13.00	0.3337
1973	103.8	2.6077	13.00	0.3390
1974	114.2	2.3720	13.00	0.3084
1975	149.9	1.8066	13.00	0.2349
1976	158.9	1.7042	13.00	0.2215
197T	181.0	1.4961	13.00	0.1945
1977	195.1	1.3877	13.00	0.1804
1978	224.3	1.2075	13.00	0.1570
1979	244.6	1.1073	13.00	0.1440
1980	245.2	1.1046	13.00	0.1436
1981	270.8	1.0000	13.00	0.1300

COMPUTATIONS FOR ALUMINUM ROD, SCREW MACH

10 25 01 13 ALUMINUM ROD, SCREW MACHINE STOCK 2011-T3

FISCAL YEAR	PRICE INDEX	INFLATION FACTOR	%	COMPUTATION
1968	100.0	2.1990	3.00	0.0660
1969	90.2	2.4384	3.00	0.0732
1970	92.7	2.3724	3.00	0.0712
1971	93.2	2.3586	3.00	0.0708
1972	93.3	2.3565	3.00	0.0707
1973	93.2	2.3597	3.00	0.0708
1974	102.2	2.1514	3.00	0.0645
1975	142.0	1.5484	3.00	0.0465
1976	147.8	1.4874	3.00	0.0446
197T	155.6	1.4128	3.00	0.0424
1977	160.9	1.3666	3.00	0.0410
1978	171.2	1.2841	3.00	0.0385
1979	186.0	1.1822	3.00	0.0355
1980	202.0	1.0884	3.00	0.0327
1981	219.9	1.0000	3.00	0.0300

COMPUTATIONS FOR ALUMINUM EXTRUSION

10 25 01 17 ALUMINUM EXTRUSION, SOLID CIRCLE SIZE 4 TO 5

FISCAL YEAR	PRICE INDEX	INFLATION FACTOR	%	COMPUTATION
1968	100.0	3.0630	10.00	0.3063
1969	106.7	2.8694	10.00	0.2869
1970	116.4	2.6305	10.00	0.2630
1971	121.3	2.5251	10.00	0.2525
1972	121.6	2.5194	10.00	0.2519
1973	123.7	2.4762	10.00	0.2476
1974	132.7	2.3089	10.00	0.2309
1975	162.4	1.8864	10.00	0.1886
1976	170.7	1.7948	10.00	0.1795
197T	188.4	1.6261	10.00	0.1626
1977	205.3	1.4923	10.00	0.1492
1978	226.7	1.3513	10.00	0.1351
1979	245.8	1.2461	10.00	0.1246
1980	280.2	1.0930	10.00	0.1093
1981	306.3	1.0000	10.00	0.1000

COMPUTATIONS FOR COPPER

10 25 02 COPPER AND BRASS MILL SHAPES

FISCAL YEAR	PRICE INDEX	INFLATION FACTOR	%	COMPUTATION
1968	100.0	2.0772	1.00	0.0208
1969	98.8	2.1034	1.00	0.0210
1970	121.5	1.7103	1.00	0.0171
1971	113.3	1.8331	1.00	0.0183
1972	113.1	1.8368	1.00	0.0184
1973	121.1	1.7153	1.00	0.0172
1974	154.1	1.3476	1.00	0.0135
1975	155.1	1.3395	1.00	0.0134
1976	142.3	1.4599	1.00	0.0146
197T	158.9	1.3073	1.00	0.0131
1977	156.8	1.3250	1.00	0.0133
1978	155.3	1.3377	1.00	0.0134
1979	189.5	1.0961	1.00	0.0110
1980	215.4	0.9642	1.00	0.0096
1981	207.7	1.0000	1.00	0.0100

COMPUTATIONS FOR NICKEL ALLOY

10 25 04 63 MONEL SHEET, C.R.,400 ALLOY

FISCAL YEAR	PRICE INDEX	INFLATION FACTOR	%	COMPUTATION
1968	100.0	3.6548	23.00	0.8406
1969	104.8	3.4806	23.00	0.8024
1970	118.8	3.0767	23.00	0.7076
1971	132.1	2.7663	23.00	0.6363
1972	136.3	2.6823	23.00	0.6169
1973	139.3	2.6237	23.00	0.6035
1974	149.5	2.4446	23.00	0.5623
1975	198.1	1.8450	23.00	0.4243
1976	223.7	1.6334	23.00	0.3757
197T	234.4	1.5594	23.00	0.3587
1977	246.3	1.4838	23.00	0.3413
1978	254.8	1.4341	23.00	0.3298
1979	287.4	1.2714	23.00	0.2924
1980	373.5	0.9786	23.00	0.2251
1981	365.5	1.0000	23.00	0.2300

COMPUTATIONS FOR TITANIUM
10 25 05 TITANIUM MILL SHAPES (FROM DEC 70)
(MULTIPLIED BY .955 FOR CONTINUITY WITH
10 22 01 56 TITANIUM SPONGE INDEX(BEFORE DEC 70))

FISCAL YEAR	PRICE INDEX	INFLATION FACTOR	%	COMPUTATION
1968	100.0	3.3044	2.00	0.0661
1969	99.4	3.3244	2.00	0.0665
1970	96.3	3.4311	2.00	0.0686
1971	96.7	3.4163	2.00	0.0683
1972	100.6	3.2847	2.00	0.0657
1973	102.8	3.2153	2.00	0.0643
1974	110.6	2.9885	2.00	0.0598
1975	148.7	2.2229	2.00	0.0445
1976	164.4	2.0096	2.00	0.0402
1977T	164.4	2.0096	2.00	0.0402
1977	163.6	2.0203	2.00	0.0404
1978	164.0	2.0149	2.00	0.0403
1979	186.4	1.7728	2.00	0.0355
1980	258.7	1.2774	2.00	0.0255
1981	330.4	1.0000	2.00	0.0200

APPENDIX E

WEIGHTED LABOR INDEX

FY	LABOR		
	GOVERNMENT	CONTRACTOR	TOTAL
1968	0.9275	1.5149	2.4424
1969	0.8748	1.4330	2.3078
1970	0.7782	1.3508	2.1290
1971	0.7342	1.2670	2.0011
1972	0.6943	1.1979	1.8922
1973	0.6510	1.1365	1.7875
1974	0.6209	1.0711	1.6919
1975	0.5895	0.9933	1.5828
1976	0.5609	0.9275	1.4883
1977	0.5542	0.9128	1.4671
1977	0.5271	0.8526	1.3798
1978	0.4924	0.7871	1.2796
1979	0.4670	0.7310	1.1980
1980	0.4364	0.6650	1.1014
1981	0.4000	0.6000	1.0000

APPENDIX F

WEIGHTED MATERIAL INDEX

FY	MATERIAL													
	RUBBER	FIBER-GLASS	NOMEX	FLT SHT STEEL	STAIN-LESS ST	CO FOR-GINGS	COBALT ALLOY	ALUM SHEET	ALUM POD	ALUM EXT	COPPER	NICKEL ALLOY	TITAN-IUM	TOTAL
1968	0.0226	0.0677	0.2581	0.3976	0.2787	0.1898	0.4775	0.3520	0.0660	0.3063	0.0208	0.8406	0.0661	3.3347
1969	0.0221	0.0663	0.2632	0.3795	0.2713	0.1748	0.4775	0.3316	0.0732	0.2869	0.0210	0.8024	0.0665	3.2364
1970	0.0215	0.0645	0.2493	0.3592	0.2282	0.1618	0.4275	0.3196	0.0712	0.2630	0.0171	0.7076	0.0686	2.9591
1971	0.0211	0.0634	0.2506	0.3387	0.2163	0.1524	0.4016	0.3250	0.0708	0.2525	0.0183	0.6363	0.0683	2.8153
1972	0.0211	0.0632	0.2436	0.3109	0.2085	0.1434	0.3800	0.3337	0.0707	0.2519	0.0184	0.6169	0.0657	2.7279
1973	0.0209	0.0626	0.2298	0.3007	0.2393	0.1368	0.3355	0.3390	0.0708	0.2476	0.0172	0.6035	0.0643	2.6679
1974	0.0191	0.0573	0.2025	0.2853	0.2145	0.1273	0.2767	0.3084	0.0645	0.2309	0.0135	0.5623	0.0598	2.4222
1975	0.0156	0.0468	0.1477	0.2154	0.1656	0.1005	0.2292	0.2349	0.0465	0.1886	0.0134	0.4243	0.0445	1.8731
1976	0.0150	0.0450	0.1431	0.2074	0.1753	0.0905	0.2172	0.2215	0.0446	0.1795	0.0146	0.3757	0.0402	1.7697
197T	0.0143	0.0423	0.1384	0.1934	0.1657	0.0828	0.1934	0.1945	0.0424	0.1626	0.0131	0.3587	0.0402	1.6423
1977	0.0138	0.0415	0.1427	0.1806	0.1489	0.0788	0.1654	0.1804	0.0410	0.1492	0.0133	0.3413	0.0404	1.5373
1978	0.0133	0.0400	0.1461	0.1620	0.1438	0.0711	0.1136	0.1570	0.0385	0.1351	0.0134	0.3298	0.0403	1.4041
1979	0.0122	0.0367	0.1299	0.1467	0.1338	0.0632	0.0331	0.1440	0.0355	0.1246	0.0110	0.2924	0.0355	1.2036
1980	0.0108	0.0325	0.1080	0.1381	0.1225	0.0554	0.0353	0.1436	0.0327	0.1093	0.0096	0.2251	0.0255	1.0484
1981	0.0100	0.0300	0.1000	0.1250	0.1250	0.0500	0.0400	0.1300	0.0300	0.1000	0.0100	0.2300	0.0200	1.0000

APPENDIX G

HISTORICAL INFLATION INDICES

6.1/6.2 R&D EFFORT			
FY	SUBINDEX		R&D
	LABOR	MAT	INDEX
1968	2.3203	0.1667	2.4870
1969	2.1924	0.1618	2.3543
1970	2.0226	0.1480	2.1706
1971	1.9011	0.1408	2.0418
1972	1.7976	0.1364	1.9340
1973	1.6981	0.1334	1.8315
1974	1.6073	0.1211	1.7285
1975	1.5037	0.0937	1.5973
1976	1.4139	0.0885	1.5024
1977T	1.3937	0.0821	1.4758
1977	1.3108	0.0769	1.3876
1978	1.2156	0.0702	1.2858
1979	1.1381	0.0602	1.1983
1980	1.0464	0.0524	1.0988
1981	0.9500	0.0500	1.0000

HISTORICAL INFLATION INDICES

**********6.3 R&D EFFORT**********

FY	SUBINDEX		R&D
	LABOR	MAT	INDEX
1968	2.1982	0.3335	2.5316
1969	2.0771	0.3236	2.4007
1970	1.9161	0.2959	2.2121
1971	1.8010	0.2815	2.0826
1972	1.7030	0.2728	1.9758
1973	1.6087	0.2668	1.8755
1974	1.5227	0.2422	1.7650
1975	1.4245	0.1873	1.6118
1976	1.3395	0.1770	1.5165
197T	1.3204	0.1642	1.4846
1977	1.2418	0.1537	1.3955
1978	1.1516	0.1404	1.2920
1979	1.0782	0.1204	1.1985
1980	0.9913	0.1048	1.0961
1981	0.9000	0.1000	1.0000

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HISTORICAL INFLATION INDICES

**********6.4 R&D EFFORT**********

FY	SUBINDEX		R&D
	LABOR	MAT	INDEX
1968	2.0760	0.5002	2.5763
1969	1.9617	0.4855	2.4471
1970	1.8097	0.4439	2.2536
1971	1.7010	0.4223	2.1233
1972	1.6084	0.4092	2.0176
1973	1.5194	0.4002	1.9195
1974	1.4381	0.3633	1.8015
1975	1.3454	0.2810	1.6263
1976	1.2651	0.2655	1.5305
1977	1.2470	0.2463	1.4934
1978	1.1728	0.2306	1.4034
1979	1.0876	0.2106	1.2982
1980	1.0183	0.1805	1.1988
1981	0.9362	0.1573	1.0935
	0.8500	0.1500	1.0000

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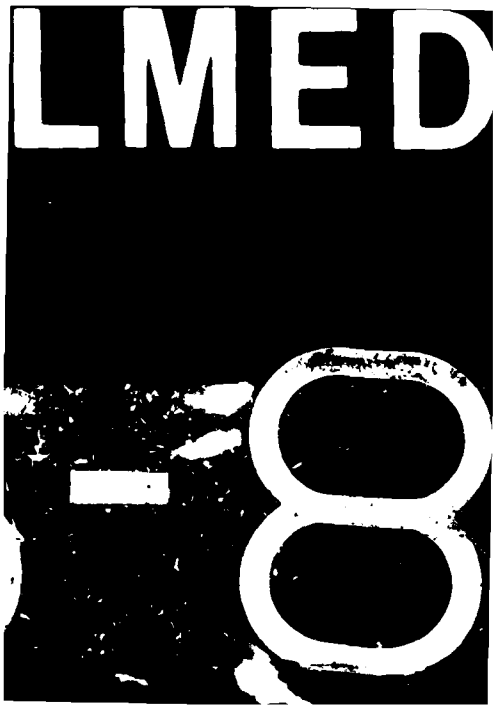
HISTORICAL INFLATION INDICES

FY	SUBINDEX		R&D
	LABOR	MAT	INDEX
1968	1.8318	0.8337	2.6655
1969	1.7309	0.8091	2.5400
1970	1.5968	0.7398	2.3366
1971	1.5009	0.7038	2.2047
1972	1.4192	0.6820	2.1011
1973	1.3406	0.6670	2.0076
1974	1.2690	0.6056	1.8745
1975	1.1871	0.4683	1.6554
1976	1.1163	0.4424	1.5587
1977T	1.1003	0.4106	1.5109
1977	1.0348	0.3843	1.4191
1978	0.9597	0.3510	1.3107
1979	0.8985	0.3009	1.1994
1980	0.8261	0.2621	1.0882
1981	0.7500	0.2500	1.0000

*****OTHER R&D(25% MATERIAL)*****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